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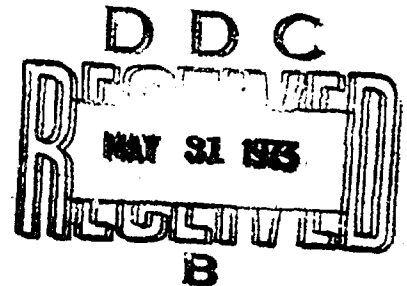
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# FEASIBILITY TEST OF THE INCENDIARY TORCH REMOTE OPENING DEVICE (ITROD) AGAINST A CAR BOMB

by  
*Michael Shapiro*

APRIL 1973



**NAVAL EXPLOSIVE ORDNANCE DISPOSAL FACILITY  
INDIAN HEAD, MARYLAND 20640**

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AGAINST A CAR BOMB**

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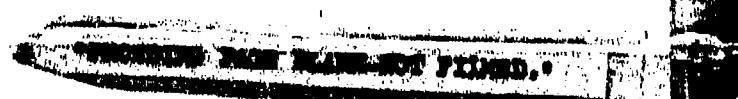
## FOREWORD

This technical report concerns the results of a single test to determine if the Incendiary Torch Remote Opening Device (ITROD) can be used to defeat or partially defeat a car bomb containing large quantities of improvised explosives.

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**ABSTRACT**

An attempt was made to defeat a car bomb using the Incendiary Torch Remote Opening Device (ITROD) to burn through a locked car trunk and ignite the improvised explosive. In order to reduce the overall blast effect and resulting damage, it was hoped that a sufficient quantity of the explosive would burn before detonation occurred. The trunk was successfully penetrated and approximately 80 percent of the explosive burned prior to detonation.



## SUMMARY

Car bombs containing 300 to 400 pounds of explosives have frequently been used in Northern Ireland. One approach for defeating these bombs is to ignite and burn a sufficient quantity of the explosive so that the damage resulting from a detonation of the remaining charge would be greatly reduced. The ITROD is a small, portable, lightweight torch that can be remotely actuated and is capable of very rapidly penetrating thick metal and igniting combustible materials.

A car bomb was constructed by placing three plastic bags of oil-soaked wood shavings and one 80 pound bag of ammonium nitrate-fuel oil (ANFO) explosive into the trunk compartment of an automobile. Range explosive limits necessitated the use of wood shavings as a substitute for an all ANFO bomb. The bag of ANFO was boosted with four sticks of commercial dynamite and a nonelectric blasting cap.

Four ITROD's were attached to the car trunk and simultaneously initiated. The contents of the trunk ignited and burned for 122 seconds before a detonation occurred. The resulting damage indicated approximately 10 to 15 pounds of ANFO had detonated. Burning 80 percent of the main charge was considered indicative of a "promising" approach.

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## INTRODUCTION

### OBJECTIVE

The objective of this test was to determine the feasibility of using an ITROD to render safe a large improvised explosive car bomb.

### BACKGROUND

Car bombs have been used in Northern Ireland with a high degree of success. Large quantities (300 pounds) of improvised explosives such as sugar-chlorate or ammonium nitrate-fuel oil (ANFO) are placed in plastic bags and loaded into the trunks of automobiles. These charges are boosted with several pounds of dynamite which is primed with either a blasting cap or detonating cord. A clock mechanism is normally used to initiate the charge; however, there may also be antidisturbance devices installed. An automobile is driven to the target and then abandoned.

Because of the unknown time factor and the possibility of antidisturbance devices, remote render safe procedures are desired. Obtaining access to the explosive through the locked trunk of the car and disposal of 300 pounds of explosive are relatively difficult tasks.

### APPROACH

One approach at defeating a car bomb is to ignite and burn a sufficient quantity of explosives before a detonation occurs. Previous attempts have resulted in detonations after approximately 20 seconds. It is believed that once the flame reaches the detonator it will function and initiate the remaining charge. Twenty seconds of burning does not reduce the size of the charge to an acceptable level. In addition, there have been problems in gaining access to and igniting the charge from remote locations.

The ITROD is capable of penetrating metal and igniting combustible materials in a very rapid, but controlled manner. It can also be operated from a remote location. A single test was conducted to establish the feasibility of the ITROD as a tool for defeating car bombs. The explosive was ignited and the burn time recorded. Motion pictures and still photographs were taken for documentation.

## TECHNICAL DISCUSSION

### CAR BOMB

The car bomb was constructed to be typical of those actually encountered in field operations. Because of range explosive limits, only 80 pounds of explosives could be used. Three plastic bags filled with oil-soaked wood shavings and one 80-pound bag of ANFO were placed

in the trunk of an automobile. The ANFO was prepared by mixing 80 pounds of prilled ammonium nitrate (fertilizer grade) with a sufficient amount of diesel fuel to coat the prills. The oil-soaked wood shavings were used to simulate three additional bags of ANFO. It was hoped that the burning characteristics would be relatively identical. The ANFO was placed in the center of the trunk with the bags of oil-soaked wood shavings surrounding it. Four sticks of 40 percent ammonium nitrate dynamite were placed directly on top of the ANFO. See Figure 1. A nonelectric blasting cap, attached to 30 feet of detonating cord, was inserted into the dynamite. The detonating cord extended out from the car through a small hole and was attached to an electric blasting cap. Following the test, the electric cap would be fired and any remaining explosive would be disposed. The dynamite, detonating cord, and nonelectric blasting cap are shown in Figure 2.

#### ITROD

ITROD is a compact, electrically initiated, cutting torch which is capable of penetrating a 3/4-inch steel plate in less than 2 seconds. It employs an incendiary mixture (PYRONOL) which generates its own pressure to eject a high-velocity stream of high-temperature molten particles through a given nozzle. The torches may be attached to templates and a specifically shaped cut can be produced with the appropriate choice of nozzles.



*Figure 1. Positioning of Bagged ANFO and Dynamite in Trunk of Automobile.*





Figure 2. Components Used in Test Setup.

#### TEST SETUP

Two double-torch assemblies (four torches) were used in the test. The torches were attached to the templates and the templates secured to the trunk lid using bolts with wing nuts. In a real situation, an alternate method of attachment, such as strapping, would be used. The torches used linear nozzles to produce two straight cuts through the lid and uniformly ignite the explosive. Figure 3 shows the ITROD's attached to the templates. Figure 4 shows the ITROD assemblies attached to the trunk lid. The bag of ANFO and the dynamite were located between the torch assemblies. The torches were wired in series to obtain simultaneous ignition, and the trunk lid was locked in the closed position. A Mitchell camera recorded the event at 24 frames/second (real time) and a Hycam camera recorded the event at 200 frames/second.

#### TEST RESULTS

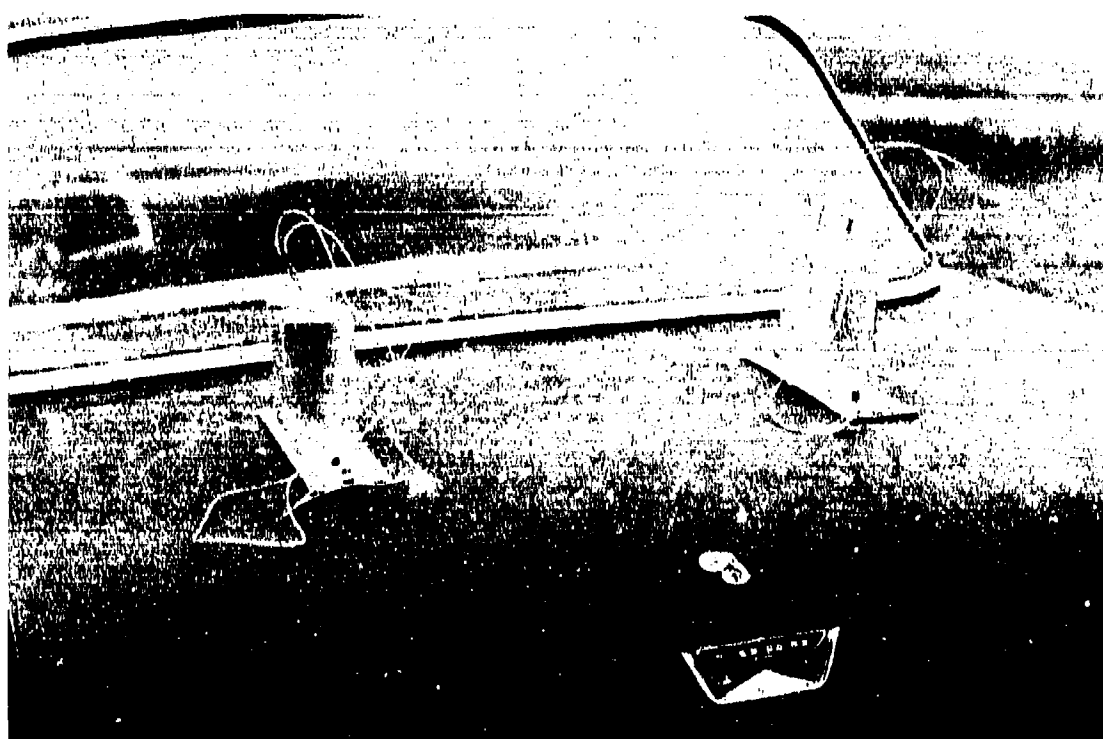
The ITROD's were ignited and the test recorded on film. An analysis of the film showed the following sequence of events.

EVENT	TIME (sec)
Ignition of first torch	0
Ignition of fourth torch	0.33
Trunk lid begins to open	0.35
Trunk lid fully opened	0.58
End of all torch burning	2.70
Detonation of remaining explosive	122.9

The torches cut through the trunk lid and ignited the trunk contents. The thrust produced by the torches (approximately 260 pounds) was sufficient to force open the trunk lid 0.58 seconds after ignition. The burning contents of the trunk produced a yellow-reddish flame which extended approximately 4 to 5 feet above the trunk. The smoke was a white-grayish color. A detonation occurred 122 seconds after ignition. It is believed that once the flames reach the detonator and it functions, the remaining explosive will detonate. In this test the detonator and dynamite were located in the center between the two rows of torches. Therefore, the torches did not directly hit the detonator.

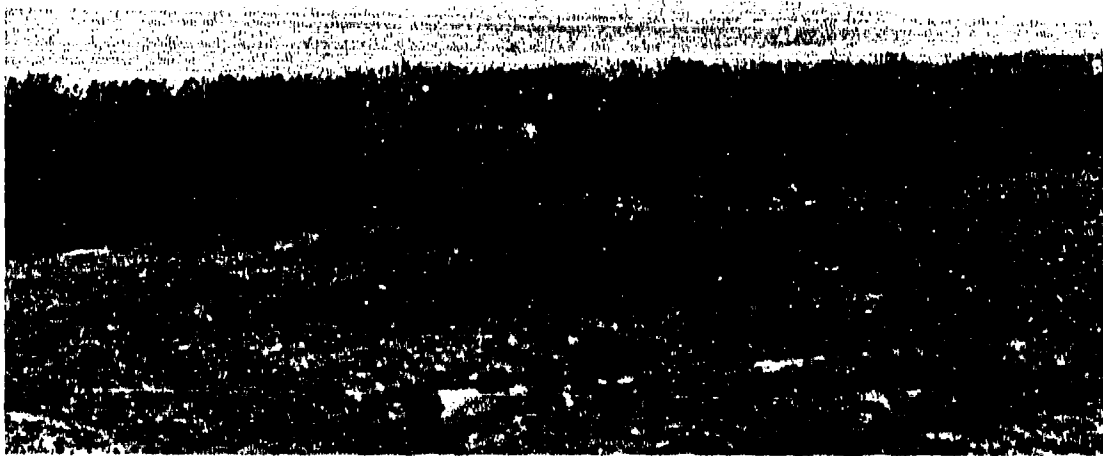


*Figure 3. ITROD's Attached to Templates.*



*Figure 4. ITROD Assemblies Attached to Trunk of Automobile.*

Examination of the crater in the earth and the damage to the automobile (Figure 5) indicated that 10 to 15 pounds of ANFO had detonated. Thus, over 80 percent of the explosive charge had been successfully burned.



*Figure 5. Examination of Test Results.*

### CONCLUSIONS

The ITROD has demonstrated to be a feasible method of penetrating automobiles and igniting explosives. The amount of explosive burned prior to detonation cannot be determined in all instances based on the results of one test. It is quite possible that a poor choice of location for the ITROD may cause the detonator to function before any substantial quantity of explosive has burned. However, the proper positioning of the ITROD's might provide consistently successful results. It must be determined by the particular responsible agency as to whether the ITROD provides the best available solution in defeating this type of car bomb.

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3. Torches						
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5. Bombs						
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